

CLAIMS

1. A gas discharge panel, which comprises (a) a first substrate and a second substrate facing each other across an interval, the interval forming a discharge space and being filled with discharge gas, (b) pairs of electrodes for sustaining discharge provided on at least one of the substrates, (c) a plurality of discharge cells formed in a pattern along the electrode pairs, and (d) a plurality of phosphor layers formed by baking a phosphor film and provided on the first substrate facing the discharge cells, each phosphor layer corresponding to an illumination color of the discharge cell, and the gas discharge panel displaying a color image by selectively illuminating the discharge cells, wherein a plurality of gap members of a given shape are disposed at locations corresponding to boundary areas between and excluding the center areas of the discharge cells, so as to separate the first substrate and second substrate, and determine the interval between the first substrate and second substrate.
2. The gas discharge panel of Claim 1, wherein the electrode pairs and their surrounding structures are provided such that, when a voltage is applied to the electrode pairs and sustaining discharge is caused, discharge primarily occurs in the center of the discharge cells, rather than near the boundaries.
3. The gas discharge panel of Claim 2, wherein

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the electrode pairs comprise a plurality of linear electrodes, provided in a stripe pattern on the second substrate, and

an interval between the linear electrodes forming the pairs
5 is smaller in the center of the discharge cells than toward the boundaries of the discharge cells.

4. The gas discharge panel of Claim 2, wherein
each electrode pair has a transparent electrode, and
10 the transparent electrode has a shape such that an interval between the linear electrodes forming the pair is smaller in the center of the discharge cell than toward the boundaries of the discharge cell.

15 5. The gas discharge panel of Claim 2, wherein
each electrode pair is covered with a dielectric layer in
an area toward the discharge space, and
the dielectric layer has a thickness which is smaller in
the center of the discharge cell than toward the boundaries of
20 the discharge cell.

6. The gas discharge panel of Claim 2, wherein
each electrode pair is covered with a dielectric layer in
an area toward the discharge space, and
25 the dielectric layer is covered with a layer of magnesium
oxide in an area toward the center of the discharge cell and
excluding the boundary area.

7. The gas discharge panel of any of Claims 1 through 5, wherein
the second substrate has a black matrix formed in areas
corresponding to boundary areas.

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8. The gas discharge panel of any of Claims 1 through 4, wherein
the phosphor layers are thinner towards the boundaries than
in the center areas.

10 9. The gas discharge panel of Claim 8, wherein
a dielectric layer is provided on the first substrate,
the phosphor layers are provided on the dielectric layer,
and

15 the gap members are partially buried in the dielectric
layer.

10. The gas discharge panel of Claim 8, wherein
the electrode pairs comprise a plurality of linear
electrodes, provided in a stripe pattern on the second substrate,
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the phosphor layers are provided in a stripe pattern in a
direction which intersects with the electrode pairs.

11. The gas discharge panel of Claim 1, wherein
25 a dielectric layer is provided on the second substrate, and
the gap members are partially buried in the dielectric
layer.

12. The gas discharge panel of Claim 1, wherein
a phosphor element is applied to their surfaces of the gap
members.

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13. The gas discharge panel of Claim 1, wherein
the gap members have a spherical or rod-like shape.

14. The gas discharge panel of Claim 1, wherein
10 the gap members are in contact with at least one of the first
substrate and second substrate.

15. A gas discharge panel having a first substrate and a second
substrate, facing each other across an interval, the interval
15 forming a discharge space and filled with discharge gas, pairs
of electrodes for sustaining discharge provided on at least one
of the substrates, a plurality of discharge cells formed in a
matrix pattern along the electrode pairs, a plurality of phosphor
layers, formed by baking a phosphor film and corresponding to an

20 illumination color of each discharge cell, provided on the first
substrate facing the discharge cells, and which displays a color
image by selectively illuminating the discharge cells, wherein
the discharge gas is filled to a pressure of from 80 percent
to 120 percent, inclusive, of atmospheric pressure,

25 the first substrate and second substrate contact each other
around the outside of a image display area, and
the first substrate and second substrate do not contact each

other across a plurality of discharge cells in two dimensions of the image display area.

16. The gas discharge panel of Claim 15, wherein

5 the electrode pairs and their surrounding structures are provided such that, when a voltage is applied to the electrode pairs and sustaining discharge is caused, discharge primarily occurs in the center of the discharge cells, rather than near the boundaries.

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17. (cancelled)

18. A gas discharge panel display device, which displays an image by selectively illuminating the plurality of discharge cells,
15 comprising:

· the gas discharge panel of Claim 1 or Claim 15, and
 a driving unit, which applies a voltage to the electrode pairs for sustaining discharge.

20 19. A method for production of a gas discharge panel, the panel having discharge cells of each color arranged in a matrix pattern formed between a first substrate and a second substrate, the production method comprising:

25 a phosphor layer forming process, for providing a phosphor layer corresponding to an illumination color of each discharge cell on the first substrate,

 a gap member distribution process, for disposing gap

members of a given shape at locations on the first substrate and the second substrate corresponding to boundaries between discharge cells, and

5 a stacking process, for joining the first substrate and the second substrate after gap members have been applied to one of the substrates.

20. The gas discharge panel production method of Claim 19, wherein

10 the phosphor layer forming process is conducted before the gap member distribution process, and

the phosphor layers on the first substrate are formed so as to be thicker towards the center of the discharge cells than in areas corresponding to the boundaries.

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21. The gas discharge panel production method of Claim 20, wherein

20 an area where phosphor layers are not formed in the phosphor layer forming process has a width of at least 50 percent and not more than 100 percent of the interval between the substrates as determined by the gap members.

22. The gas discharge panel production method of Claim 20, in which the gap members have a shape so as to fit into the boundary areas between the phosphor layers of adjacent discharge cells, wherein

the gap member distribution process includes:

a distribution step, for spreading gap members over the first substrate, and

a removal step, for removing the gap members distributed on the phosphor layers.

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23. The gas discharge panel production method of Claim 20, wherein

the phosphor layer formation process includes a phosphor film application step, for applying a film containing phosphor element of each color to locations corresponding to the discharge cells on the first substrate.

24. The gas discharge panel production method of Claim 23, wherein

15 in the phosphor film application step, the phosphor element film including photosensitive material is applied to the first substrate and patterned by exposure to light.

25. The gas discharge panel production method of Claim 23, 20 wherein

in the phosphor layer formation process, the phosphor element film is applied to areas of the first substrate excluding areas corresponding to boundaries.

25 26. The gas discharge panel production method of Claim 20, wherein

a dielectric layer application process, for applying a

dielectric element paste to the surface of the first substrate, is provided before the phosphor layer forming process, and the applied dielectric element paste is baked after the gap member distribution process.

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27. The gas discharge panel production method of Claim 19, wherein

the gap member distribution process includes:

an adhesive layer forming step, for providing an adhesive

10 layer in areas of the first substrate or the second substrate corresponding to the boundaries, and

a gap member distribution step, for spreading gap members over the adhesive layer.

15 28. The gas discharge panel production method of Claim 27, wherein

the gap member distribution process includes, after the gap member distribution step, a removal step, for removing the gap members located in areas of the first substrate or the second 20 substrate other than on the adhesive layer.

29. The gas discharge panel production method of Claim 22 or Claim 27, wherein

in the removal step, gap members are removed by blowing gas

25 over or by agitating the substrate to which gap members were applied.

30. The gas discharge panel production method of Claim 19,
wherein

the gap member distribution process includes:

a mask locating step, for applying a mask, which covers an
5 area corresponding to the center of each discharge cell where gap
members are to be distributed, and which has an opening at the
boundaries,

a spreading step, for spreading gap members over the mask,
and

10 a detaching step, for removing the mask from the substrate.

31. The gas discharge panel production method of Claim 30,
further comprising:

an adhesive application process, before the gap member
15 distribution process, for applying an adhesive material to
surfaces of the gap members.

32. A method for production of a gas discharge panel, comprising:

an electrode forming process, for forming electrodes on a
20 first substrate,

a dielectric element material application process, for
applying a dielectric element material to cover the electrodes,

a dielectric element baking process, for baking the applied
dielectric element, and

25 after the dielectric element material application process,
a stacking process, for joining the first substrate to a second
substrate.

33. A method for production of a gas discharge panel, comprising:

 a phosphor element material application process, for applying a phosphor element material, which contains gap members,

5 to a first substrate,

 a phosphor element baking process, for baking the applied phosphor element material to form a phosphor layer, and,

 after the phosphor element material application process,

 a stacking process, for joining the first substrate to a second

10 substrate.